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Eastern Pacific Expeditions of the New York Zoological Society. Stomatopod Crustacea.

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(Figures 1-3)

Nineteen species of stomatopods were taken by the Eastern Pacific Expeditions of the New York Zoological Society in 1936 and 1937-38. *Lysiosquilla desaussurei* (Stimpson) is redescribed and *Gonodactylus zacae* is newly described. The collections include the second record for each of ten species.

Introduction

In 1936 and again in 1937-38, the New York Zoological Society sponsored two expeditions to the tropical eastern Pacific region under the direction of William Beebe. During the first of these, the Templeton Crocker Expedition (1936), collections were made on the west coast of Baja California, the southern portions of the Gulf of California, as well as off Clarion Island and the Revillagigedo Islands. During the second expedition, the Eastern Pacific *Zaca* Expedition (1937-1938), collections were made at several localities between southern México and Gorgona Island, Colombia. Stations for both expeditions are shown in Figure 1.

The stomatopod crustaceans collected during these expeditions were loaned to me for study by Dorothy E. Bliss, American Museum of Natural History. Except for one lot of paratypes of a new *Gonodactylus* described in the report and one female *Lysiosquilla desaussurei* which have been deposited in the collection of the Division of Crustacea, National Museum of Natural History, Smithsonian Institution (USNM), all of the specimens are in the collection of the American Museum of Natural History.

I am indebted to Dorothy Bliss for allowing me to work with this interesting collection and to Horton H. Hobbs, Jr., for taking his time to comment on the manuscript. Figures 2 and 3 were prepared by my wife Lilly.

Although relatively little information on the stomatopods of the eastern Pacific region has been published since the review of the eastern Pacific species by Waldo L. Schmitt in 1940, there have been several name changes at the generic level which affect the nomenclature of the eastern Pacific species. In addition, several new families have been recognized within the stomatopods. For these reasons, keys to the eastern Pacific species of each of three families, Gonodactylidae, Lysiosquillidae, and Squillidae, are presented below.

The collections reported here were found to include a new species, *Gonodactylus zacae*; a species not recorded since its original description in 1857, *Lysiosquilla desaussurei* (Stimpson); and a series of *Gonodactylus festae lalibertadensis* which indicates it should be accorded specific status. In addition, the collections include only the second record for ten species, seven of which were described by Schmitt (1940). Overall, these collections add greatly to our knowledge of the species composition of the eastern Pacific stomatopods and add information on their geographic ranges; significant range extensions are reported for several species.

Unfortunately, relatively little ecological information was included in the locality data. Such information, as well as observations on color in life of stomatopods, will be increasingly needed in future systematic studies.

Synonymies are generally restricted to the original references, to an earlier review of the eastern Pacific stomatopods by Waldo L. Schmitt (1940), and subsequent papers; citations of earlier papers can be found in Schmitt's report.

Terms and measurements used herein have been discussed in more detail elsewhere (Manning, 1969). All measurements are in millimeters (mm). Total length (TL) is measured from the anterior margin of the rostral plate to the apices of the submedian teeth of the telson; carapace length (CL) is measured on the mid-

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Table 1. Species of Stomatopoda Collected at Each of the Stations of the Eastern Pacific Expeditions, New York Zoological Society, 1936, 1937-38.

MEXICO:			
E of Cedros Island, Lower California	126 D-11	.....	*Meiosquilla polita*
Arena Bank, Gulf of California	136 D-18	.....	*Hemisquilla ensigera californiensis*
Arena Bank, Gulf of California	136 D-30	.....	*Pseudosquillopsis marmorata* *Gonodactylus zacae*
Santa Inez Bay, Gulf of California	141 D-3	.....	*Gonodactylus zacae*
Santa Inez Bay, Gulf of California	141 D-4	.....	*Squilla tiburonensis*
	143 D-5	.....	*Squilla tiburonensis*
Mazatlán	155 D-1	.....	*Squilla panamensis*
Chamela Bay	shore	.....	*Meiosquilla oculinova*
Tenacatita Bay	183 D-2	sandy mud	*Squilla hancocki*
	183 D-3	muddy sand	*Squilla panamensis*
Sihuatenejo Bay	shore	coral	*Pseudosquilla adiastalta* *Gonodactylus stanschi*
Port Guatulco	195 D-3-8, 14	rocks, sand, algae, cr. shell	*Gonodactylus zacae*
Port Guatulco	195 D-15	coral	*Pseudosquilla adiastalta* *Gonodactylus stanschi*
Tangola-Tangola Bay	196 light	surface	*Lysiosquilla desaussurei*
Tangola-Tangola Bay	196 D-16-18	mud	*Meiosquilla swetti* *Squilla hancocki* *Squilla parva* *Eurysquilla veleronis*
EL SALVADOR:			
La Libertad	198 D-1, 2	mud	*Squilla parva*
Gulf of Fonseca	199 D-1, 12	sand, mud cr. shell	*Squilla aculeata aculeata* *Squilla parva*
Gulf of Fonseca	shore	.....	*Gonodactylus festae*
NICARAGUA:			
Gulf of Fonseca	199 D-4	mud	*Squilla aculeata aculeata*
Corinto	200 D-20	mangrove leaves	*Meiosquilla swetti*
COSTA RICA:			
Port Parker	203 D-4, 7, 9	gravel, shells, algae, coral	*Gonodactylus zacae*
Port Parker	shore	coral	*Pseudosquilla adiastalta* *Gonodactylus zacae* *Gonodactylus festae* *Gonodactylus bahiahondensis*
Port Culebra	206 D-3	sandy mud	*Meiosquilla dawsoni* *Squilla parva*
Port Culebra	shore	coral	*Gonodactylus lalibertadensis* *Gonodactylus bahiahondensis*
Piedra Blanca Bay	208 L-1	surface	*Lysiosquilla desaussurei*
Piedra Blanca Bay	shore	tidepool	*Gonodactylus festae*
Jasper Island	shore	coral	*Pseudosquilla adiastalta* *Gonodactylus bahiahondensis*
off Ballenas Bay, Gulf of Nicoya	213 D-11, 13-15, 17	mud	*Squilla panamensis*
Uvita Bay	shore	coral	*Gonodactylus lalibertadensis* *Gonodactylus bahiahondensis*

PANAMA:

Gulf of Chiriqui	221 D-1, 4	sandy mud	*Hemisquilla ensigera californiensis* *Squilla panamensis*
Bahia Honda	222 D-1, 5	rocks, dead coral, mud shells, leaves	*Gonodactylus zacae* *Squilla parva*
Bahia Honda	shore	under stones	*Gonodactylus bahiahondensis*

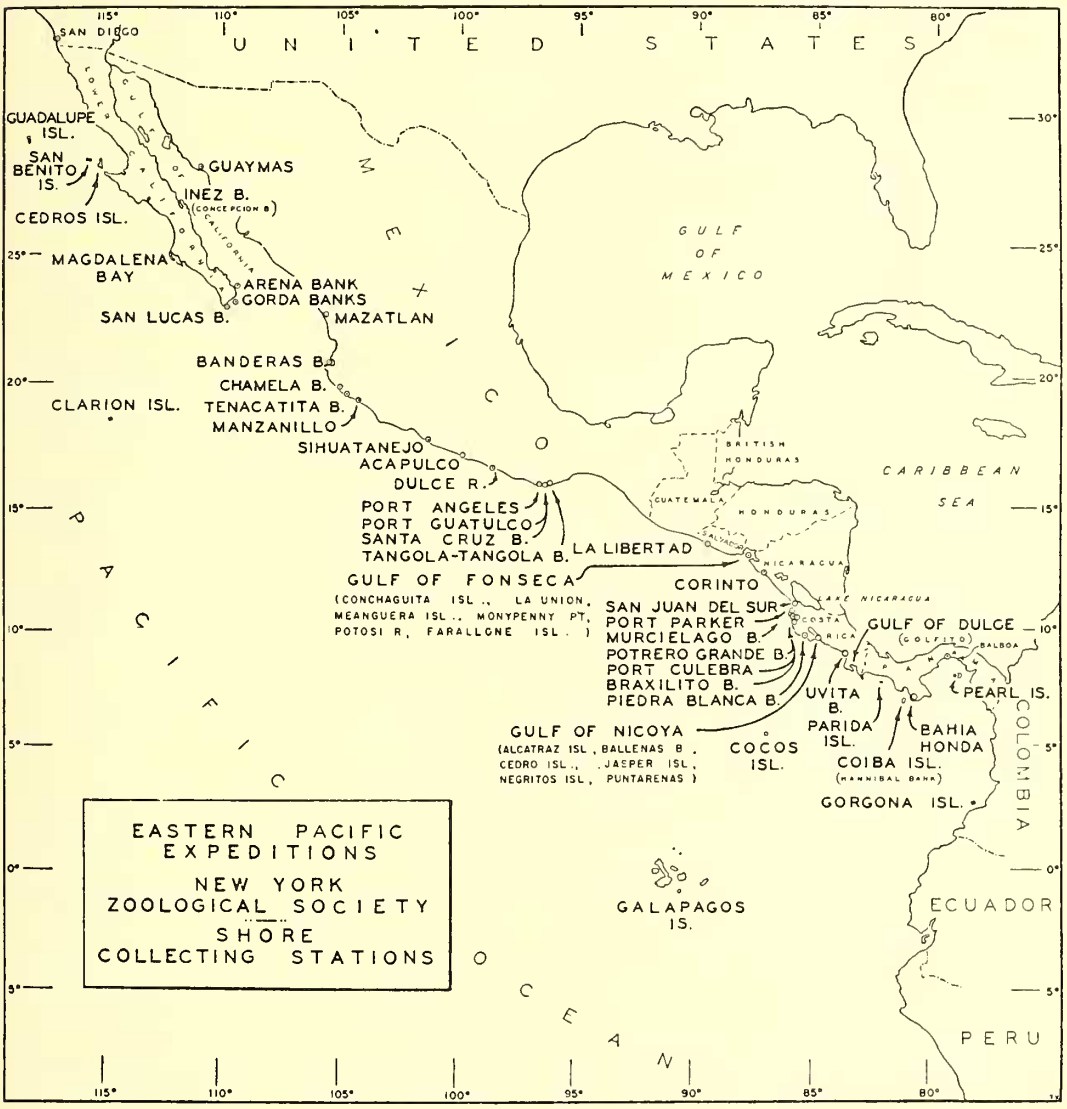

FIGURE 1. Shore collecting stations of the Eastern Pacific Expeditions of the New York Zoological Society.

line and does not include the rostral plate. Species marked with an asterisk (*) in the keys are also reported in the text of this report.

Species taken at each of the collecting stations are listed in Table 1. Station data are presented in the species accounts; additional information may be found in Beebe (1937, 1938), who gave general summaries of the expeditions together with data for each of the stations.

Systematic Account

Order Stomatopoda Latreille

Key to Families of Stomatopoda from the Eastern Pacific Region

1. Telson lacking sharp median carina; propodi of posterior three maxillipeds broad, beaded or ribbed ventrally. . Lysiosquillidae
1′. Telson with sharp median carina; propodi of posterior three maxillipeds slender, not beaded or ribbed ventrally.....2
2. More than four intermediate marginal denticles present on telson.....Squillidae
2′. No more than two intermediate marginal denticles present on telson. Gonodactylidae

Family Lysiosquillidae

Key to Genera and Species of Lysiosquillidae from the Eastern Pacific Region

1. Distal segment of endopod of anterior two walking legs elongate; proximal portion of outer margin of uropodal endopod at most angled inward, not folded.....2
1′. Distal segment of endopod of anterior two walking legs ovate or subcircular; proximal portion of outer margin of uropodal endopod with strong fold.....7
2. Dactylus of raptorial claw inflated basally; propodus of claw pectinate proximally only; rostral plate rounded or subrectangular; *Coronida* Brooks; *C. bradyi* (A. Milne-Edwards, 1869); Schmitt, 1940.
2′. Dactylus of raptorial claw not inflated basally; propodus of claw fully pectinate; rostral plate cordiform or triangular....3
3. Median dorsal surface of telson with at most a low, triangular boss; marginal teeth of telson usually fused, movable submedian teeth absent (in American species); *Lysiosquilla* Dana 4
3′. Median dorsal surface of telson with raised median projection, lobed or spined posteriorly; movable submedian marginal teeth of telson always present, remainder of teeth and denticles distinct, not fused; *Heterosquilla* Manning 5
4. Dorsal surface of telson and sixth abdominal somite smooth, not tuberculate..... .....*L. maculata* (Fabricius, 1793); Schmitt, 1940.
4′. Dorsal surface of sixth abdominal somite and telson rough, tuberculate..... .....**L. desaussurei* (Stimpson, 1857).
5. Telson with two intermediate marginal denticles (subgenus *Heterosquilla*) ....*H. polydactyla* (von Martens, 1881); Schmitt, 1940; Bahamonde, 1968; Manning, 1969.
5′. Telson with four intermediate marginal denticles (subgenus *Heterosquilloides*) 6
6. Sixth abdominal somite unarmed dorsally; raptorial claw with four teeth..... .....*H. mccullochae* (Schmitt, 1940); Manning, 1969.
6′. Sixth abdominal somite with three pairs of spines; raptorial claw with eight teeth.... .....*H. insolita* (Manning, 1963); Manning, 1969.
7. Dorsal surface of telson with fan-shaped series of five or more spines (posterior margin of dorsal surface of telson not produced into false eave overhanging true marginal armature); *Acanthosquilla* Manning ..... *A. digueti* (Coutière, 1905); Schmitt, 1940.
7′. Dorsal surface of telson unarmed or with at most a single median projection (posterior margin of dorsal surface of telson produced into a false eave overhanging true marginal armature); *Nannosquilla* Manning 8
8. Spines of basal prolongation of uropod subequal in length or outer longer than inner 9
8′. Inner spine of basal prolongation of uropod longer than outer 10
9. False eave of telson with numerous (13) posterior projections ....*N. californiensis* (Manning, 1961).
9′. False eave of telson with rounded median projection, lateral margins not markedly subdivided ....*N. chilensis* (Dahl, 1954); ..... Bahamonde, 1968.
10. False eave of telson with numerous (eight) posterior projections; anterolateral angles of rostral plate rounded ....*N. anomala* Manning, 1967.
10′. False eave of telson with rounded median projection, lateral margins not markedly subdivided; anterolateral angles of rostral plate sharp .....*N. decemspinosa* (Rathbun, 1910); Manning, 1961.

Lysiosquilla desaussurei (Stimpson, 1857)

Figure 2

Squilla desaussurei Stimpson, 1857, p. 503.

Lysiosquilla desaussurei. — Schmitt, 1940, p. 193. — Holthuis, 1967, p. 16 [other references].

Range. — Eastern Pacific region, where it was known only from the type-locality, off Mazatlán, México. The present records extend its distribution to Tangola-Tangola Bay, México, and Piedra Blanca Bay, Costa Rica.

Material examined. — Four specimens from two stations:

México

Tangola-Tangola Bay; 15°45′40″N, 96°06′-05″W; Station 196, light; 8-12 December 1937; two males, one female.

Costa Rica

Piedra Blanca Bay; 09°51′47″N, 85°29′56″W; Station 208 L-1; 1 February 1938; one male.

Measurements. — Males, TL 68-86 mm; female, TL 84 mm. Other measurements of all four specimens are as follows:

Station	196	208	196	196
Sex	♂	♂	♂	♀
Total Length	68	84	86	63
Carapace Length	12.1	13.9	14.9	11.4
Cornea Width	4.3	5.0	5.1	4.5
Rostral Plate Length	2.9	3.6	3.8	2.9
Rostral Plate Width	3.8	4.7	4.8	3.5
Antennal Scale Length	6.4	7.5	8.2	5.8
Antennal Scale Width	2.0	2.0	2.5	1.5
Propodus Length	15.9	18.0	20.1	14.3
Fifth abdominal somite Width	15.1	16.8	18.7	13.7
Telson Length	10.5	12.5	14.0	9.8
Telson Width	14.0	16.1	16.9	12.7
Uropodal Endopod Length	6.0	6.8	7.5	5.2
Uropodal Endopod Width	2.6	2.8	3.3	2.3
Corneal Index	281	278	292	253
Propodal Index	761	772	741	797
Antennal Scale L/W ratio	320	375	328	387
Uropodal Endopod L/W ratio	231	243	227	226

Diagnosis. — Rostral plate cordiform, broader than long, with median carina. Antennal protopod with anterolaterally directed spine above articulation of antennal peduncle. Antennal scale slender, length more than three times greatest width, outlined in black. Dactylus of raptorial claw with twelve teeth. Ventral keel of eighth thoracic somite acute, sharp in some specimens, directed posteriorly. Posterior two abdominal somites, telson and proximal segment of uropod with dorsal tubercles and spinules. Uropod with slender ventral spine at articulation of endopod.

Color. — Overall color pattern, as in most species of *Lysiosquilla,* barred. Antennal scale dark, outlined in black. Three broad dark bands on carapace, posteriomost darkest. Merus of claw with narrow distal black bar. Body segments each with broad anterior dark band and narrower posterior black line. Dorsal surface of telson with median and submedian black spots. Basal segment of uropod dark proximally, light distally; uropodal exopod with black spot on articulation of distal segments, distal half of distal segment light; proximal third of endopod light, distal two-thirds black.

Remarks. — The rediscovery of Stimpson's species, which was known only from the type taken off Mazatlán, Mexico, is among the more important of the carcinological findings of the *Zaca* Eastern Pacific Expeditions. *L. desaussurei* is a distinctive species which resembles the western Atlantic *L. scabricauda* (Lamarck, 1818) and the eastern Atlantic *L. hoevenii* (Herklots, 1851) in having the dorsal surface of the posterior portion of the body roughened with spinules, tubercles, and granules. It differs from both of those species in having a sharper ventral keel on the eighth thoracic somite and in having a ventral spine on the basal segment of the uropod at the articulation of the endopod.

The dorsal roughness of the posterior portion of the body is not so well developed in these shall specimens as it is in adult specimens of *L. scabricauda* (see Manning, 1969) from the western Atlantic. There are a few blunt spinules on the posterolateral margins of the fifth abdominal somite, and the sixth abdominal somite is ornamented with an incomplete anterior line of tubercles, a few dorsolateral tubercles, and several posterior spinules. The lateral portions of the dorsal surface of the telson are pitted and roughened, but not strongly tuberculate. All specimens have a dorsal patch of tubercles and spinules on the basal segment of the uropod; in some specimens these spinules may be arranged in a curved row leading to the large distal fixed spine on that segment.

All of the specimens were taken at night light stations; specimens were collected by dip net at a submerged light.

To my knowledge, this species has never been illustrated. Its diagnostic features are shown here in Figure 2.

Family Squillidae

Key to Genera and Species of Squillidae from the Eastern Pacific Region

1. Submedian teeth of telson with movable apices 2
1′. Submedian teeth of telson with fixed apices 7

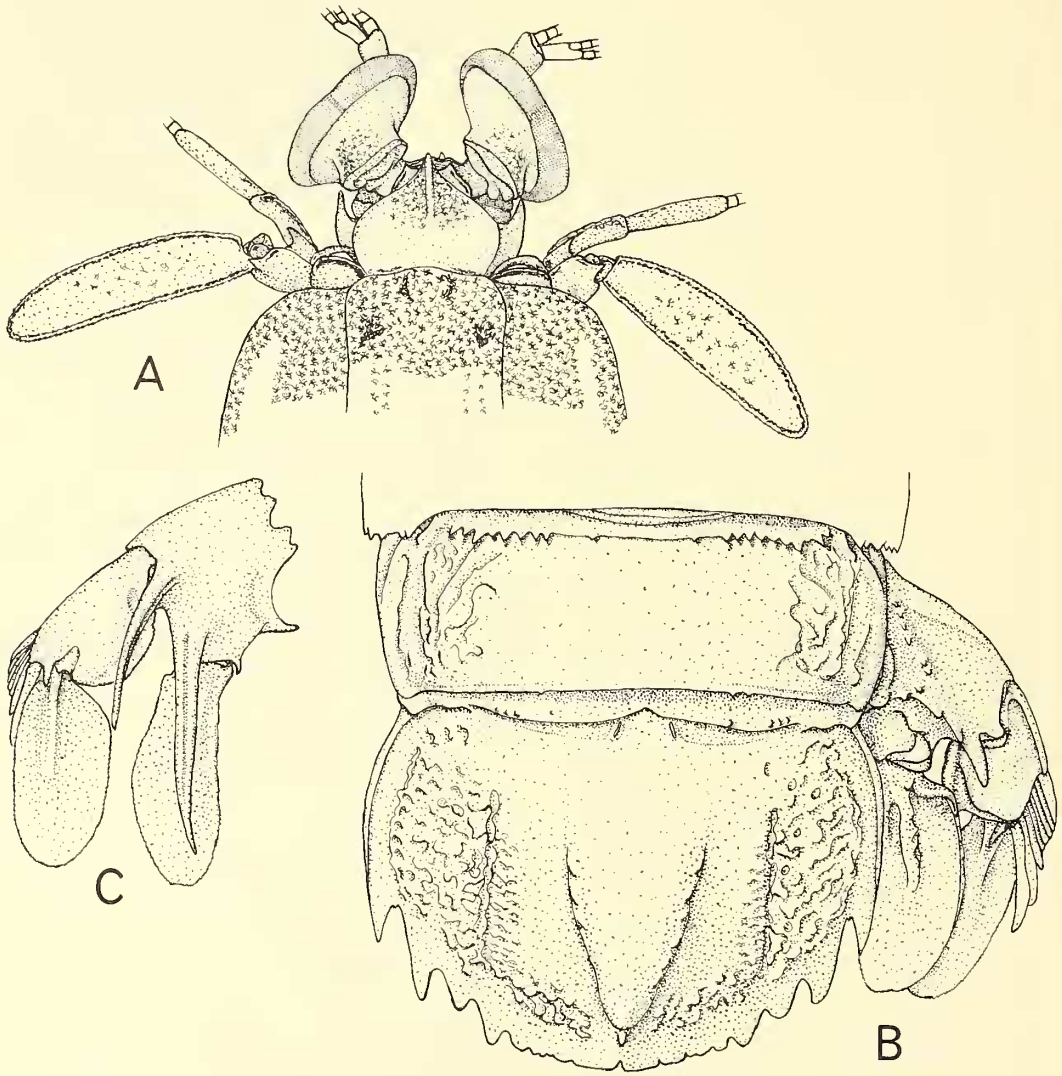

FIGURE 2. *Lysiosquilla desaussurei* (Stimpson), male, TL 84 mm, Piedra Blanca Bay: A, anterior portion of body; B, sixth abdominal somite, telson, and uropod; C, uropod, ventral view. (Setae omitted).

2. Dactylus of raptorial claw with six or more teeth; ocular scales produced into erect dorsal spines; *Pterygosquilla* Hilgendorf . 3
2′. Dactylus of raptorial claw with four to five teeth; ocular scales rounded; *Meiosquilla* Manning 4
3. Abdomen lacking submedian carinae; postanal keel absent . . . . . *P. gracilipes* (Miers, 1881); Schmitt, 1940; Bahamonde, 1968.
3′. Abdomen with submedian carinae; postanal keel present . . . . . *P. armata armata* (H. Milne-Edwards, 1837); Schmitt, 1940; Bahamonde, 1968; Manning, 1969.
4. Anterolateral angles of carapace with spines . . . . . **M. polita* (Bigelow, 1891).
4′. Anterolateral angles of carapace unarmed 5
5. Cornea anteriorly emarginate, appearing scalloped; antennules with geniculate spines . . . . . **M. oculinova* (Glassell, 1942).
5′. Cornea bilobed, not anteriorly scalloped; antennules lacking geniculate spines 6
6. Dorsal surface of telson with carinae in addition to median carina and carinae of marginal teeth . **M. swetti* (Schmitt, 1940).
6′. Dorsal surface of telson ornamented only with median carina and carinae of marginal teeth . . **M. dawsoni* Manning, 1970.
7. No more than three epipods present; eyestalks dilated, eyes flask-shaped; *Cloridopsis* Manning; *C. dubia* (H. Milne-Edwards, 1837); Schmitt, 1940; Manning, 1969.
7′. More than three epipods present; eyes T-shaped, stalk not dilated; *Squilla* Fabricius 8
8. Ischium of raptorial claw with ventrally directed spine; four epipods present . . . . . **S. aculeata aculeata* Bigelow, 1893.
8′. Ischium of raptorial claw unarmed; five epipods present 9
9. Prelateral lobe of telson spined . . . . . *S. bigelowi* Schmitt, 1940.
9′. Prelateral lobe of telson, if present, unarmed 10
10. Potanal keel of telson produced into posterior spine . . . . . *S. biformis* Bigelow, 1891; Schmitt, 1940.
10′. Postanal keel of telson unarmed 11
11. Submedian carinae of sixth abdominal somite only with posterior spines 12
11′. Submedian carinae of fifth and sixth abdominal somites with posterior spines . . 14
12. Median carina of carapace, anterior to cervical groove, with well formed anterior bifurcation; rostral plate with median carina . . . . . *S. mantoidea* Bigelow, 1893; Bigelow, 1894.
12′. Median carina of carapace, anterior to cervical groove, lacking anterior bifurcation; rostral plate lacking median carina 13
13. Intermediate carinae of carapace extending to anterior margin; lateral processes of sixth and seventh thoracic somites acute posterolaterally; telson with dorsal tubercles lateral to median carina . . . . . *S. hancocki* Schmitt, 1940.
13′. Intermediate carinae of carapace not extending to anterior margin; lateral processes of sixth and seventh thoracic somites produced into posterolateral spine; telson lacking dorsal tubercles lateral to median carina . . . . **S. tiburonensis* Schmitt, 1940.
14. Median carina of carapace, anterior to cervical groove, with anterior bifurcation; submedian carinae of fourth, fifth, and sixth abdominal somites with posterior spine . . . . . **S. panamensis* Bigelow, 1891.
14′. Median carina of carapace, anterior to cervical groove, lacking anterior bifurcation; submedian carinae of fifth and sixth abdominal somites with posterior spines . . . . . **S. parva* Bigelow, 1891.

Meiosquilla polita (Bigelow, 1891)

Squilla polita Bigelow, 1891, p. 93. — Schmitt, 1940, p. 146, fig. 2. — Manning, 1968, p. 125 [listed; transferred to *Meiosquilla*].

Range. — Eastern Pacific region, from Monterey Bay, California, to off Abreojos Point, Lower California, México.

Material examined. — México; Lower California, east of Cedros Island; 28°21′N, 115°-11′W; Station 126 D-11; 80 meters; 22 May 1936; four foot dredge; one male.

Measurements. — Broken male, CL 10.3 mm.

Meiosquilla oculinova (Glassell, 1942)

Squilla oculinova Glassell, 1942, p. 53, fig. 7. — Manning, 1968, p. 125 [listed; transferred to *Meiosquilla*].

Range. — Eastern Pacific region, where it was known only from the type-locality, off Manzanillo, México.

Material examined. — México; Chamela Bay; 17-20 November 1937; food of *Evoplites;* one male.

Measurements. — Broken male, CL 6.9 mm.

Remarks. — This striking species, characterized by the anteriorly emarginate eyes and the peculiar curved spines on the antennular peduncle, has not been recorded since its original description.

Meiosquilla swetti (Schmitt, 1940)

Squilla swetti Schmitt, 1940, p. 146, fig. 3. — Manning, 1968, p. 125 [listed; transferred to *Meiosquilla*].

Range. — Eastern Pacific region, where it was known only from the type-locality, off Petatlán Bay, México. The specimens reported here extend the range southward to Tangola-Tangola, México, and Corinto, Nicaragua.

Material examined. —Two specimens from two stations:

México

Tangola-Tangola Bay; 15°45′N-15°45′22″N, 96°05′34″W-96°05′51″W; Station 196 D-16, 17; mud; 29-42 meters; 3 December 1937; four foot dredge; one male.

Nicaragua

Corinto; 12°27′19″N, 87°11′39″W; Station 200 D-20; mangrove leaves; 2.7 meters; 7 January 1938; two foot dredge; one female.

Measurements. — Male, TL 19 mm; female, TL 31 mm.

Color. — The color pattern of this pretty species was not mentioned in the original account; the pattern is well preserved in the specimens taken by the *Zaca*. Body marked with numerous light brown chromatophores. Antennular peduncle with irregular brown markings. Antennal scale distally outlined in brown. Merus of claw with distal dark bar and proximal dark spot on dorsal depression. Carapace outlined with light brown chromatophores, with traces of two anterior diffuse dark bars and a darker posterior bar. Posterior three thoracic and anterior five abdominal somites with dark anterolateral line, rectangular median dark patch, posterior black line, and black posterolateral spot. Carinae of sixth abdominal somite and marginal teeth of telson dark. Telson with broad, irregular bar extending from lateral tooth to apex of median carina. Uropod outlined with dark pigment, distal segment of exopod and endopod black with lighter central area.

Remarks. — These specimens agree well with Schmitt's original account in most respects. There is some variability in the configuration of the dorsal carinae of the telson. The long submedian carinae may be subdivided into three portions, the anteriormost largest, and there may be only four carinae, the third longest, lateral to the submedians; in the type there were four or five carinae lateral to the submedians. The longest lateral carina may also be subdivided into two or more portions.

Meiosquilla dawsoni Manning, 1970

Meiosquilla dawsoni Manning, 1970, p. 102, fig. 3.

Range. — Eastern Pacific region, where it was known from Panama and off Guaymas, México; it has not been recorded previously from Costa Rica.

Material examined. — Costa Rica; Port Culebra; 10°36′22″N, 85°41′08″W; Station 206 D-3; sandy mud; 25.5 meters; 30 January 1938; four foot dredge; one male.

Measurements. — Male, TL 19 mm.

Remarks. — This small specimen is considerably smaller than the types, both of which were larger than 30 mm; the carinae of the sixth abdominal somite and the margins of the telson show no signs of the inflation present in the types. In other respects, this specimen agrees well with the original account of the species.

Squilla aculeata aculeata Bigelow, 1893

Squilla aculeata Bigelow, 1893, p. 101. — Schmitt, 1940, p. 158, fig. 9 [older references]. — Manning, 1968, p. 129 [listed]. — Bahamonde, 1968, p. 116.

Range. — Eastern Pacific region, from Teacapan, Sinaloa, México, several localities off Panama, and Iquique, Chile. It has not been recorded previously from Nicaragua or El Salvador.

Material examined. — Three specimens from two stations:

Nicaragua

Monypenny Point, Gulf of Fonseca; 13°03′-30″N, 87°30′20″W; Station 199 D-4; mud; 12.8 meters; 24 December 1937; four foot dredge; one female.

El Salvador

La Union, Gulf of Fonseca; 13°19′08″N, 87°47′30″W; Station 199 D-12; mud; 9.1 meters; 27 December 1937; four foot dredge; one male, one female.

Measurements. — Male, TL 65 mm; females, TL 35 and 82 mm. Corneal Indices are summarized in Table 2.

Remarks. — In a report on some stomatopods from the Gulf of Guinea, Manning (in press) showed that the eastern Atlantic *Squilla calmani* Holthuis, 1959, must be considered a subspecies of *Squilla aculeata* Bigelow from the eastern Pacific.

Squilla hancocki Schmitt, 1940

Squilla hancocki Schmitt, 1940, p. 160, fig. 10. — Manning, 1968, p. 129 [listed].

Range. — Eastern Pacific region, from off Petatlán and Tangola-Tangola Bays, México, and off Cape San Francisco, Ecuador.

Material examined. — Fourteen specimens from three stations:

Table 2. Corneal Indices of Specimens of *Squilla* from the *Zaca* Collections.

Carapace Length	*S. aculeata aculeata*	*S. hancocki*	*S. panamensis*	*S. parva*	*S. tiburonensis*
5.0				353-357 (2)	
6.0		333		321-394 (6)	
7.0	384				
8.0					
9.0					
10.0					
11.0			303		
12.0			300		328
13.0		350-353 (2)	302		
14.0	453	349	326		363
15.0			317-319 (2)		
16.0					
17.0	483		329		
18.0			342		
19.0			333-338 (2)		
20.0			328-343 (2)		

México

Tenacatita Bay; 19°14′30″N-19°15′30″N, 104°51′W-104°51′30″W; Station 183 D-2, 3; muddy sand, sandy mud; 54-73 meters; 21 November 1937; four foot dredge; seven females.

Tangola-Tangola Bay; 15°45′N-15°45′22″N, 96°05′34″W-96°05′51″W; Station 196 D-16, 17; mud; 29-42 meters; 13 December 1937; four foot dredge; two males.

Tangola-Tangola Bay; 15°44′58″N, 96°05′-13″W; Station 196 D-18; mud; 55 meters; 13 December 1937; four foot dredge; three males, two females.

Measurements. — Males, TL 20-68 mm; females, TL 32-64 mm. Corneal Indices are summarized in Table 2.

Remarks. — The characteristic color pattern described by Schmitt (1940) is visible in most of the specimens. The smaller ones lack the dorsal tubercles of the telson, but tubercles or lines of tubercles are present on the telson in all that are longer than about 50 mm in total length. All of the specimens, including the smallest, have the characteristic angled lateral process of the seventh thoracic somite.

The four smallest specimens, 20, 24, 30, and 32 mm in length are probably postlarvae. The body carination and spination is reduced, the anterolateral angles of the carapace are unarmed, and the submedian teeth of the telson are provided with movable apices. The size range of specimens exhibiting postlarval characters suggests that in this species these characters may be retained for more than one molt after the pelagic larval life is completed.

In the two large males, TL 63-68 mm, the carinae on the posterior part of the body as well as the dorsal carinae are inflated, indicating that these specimens are mature.

Squilla tiburonensis Schmitt, 1940

Squilla tiburonensis Schmitt, 1940, p. 165, fig. 11. — Manning, 1968, p. 129 [listed].

Range. — Eastern Pacific region, where it is known only from localities in the Gulf of California.

Material examined. — Three specimens from two stations:

México

Gulf of California, Santa Inez Bay; 26°59′-30″N, 111°59′W; Station 141 D-4; 36 meters; 10 April 1936; four foot dredge; one male.

Gulf of California, Santa Inez Bay; 26°54′N, 111°53′W; Station 143 D-5; 33 meters; 13 April 1936; four foot dredge; one male, one female.

Measurements. — All specimens damaged. Male, CL 11.8 mm; female, CL 13.8 mm. Corneal Indices are summarized in Table 2.

Squilla panamensis Bigelow, 1891

Squilla panamensis Bigelow, 1891, p. 94. — Schmitt, 1940, p. 166, fig. 13. — Manning, 1968, p. 129 [listed].

Range. — Eastern Pacific region, from scattered localities between Petatlán Bay, México and Cape Corrientes, Colombia.

Material examined. — Thirteen specimens from five stations:

México

Thirteen miles west of Mazatlán; 23°12′N, 106°40′W; Station 155 D-1; 102 meters; 28 April 1936; four foot dredge; one male, two females.

Tenacatita Bay; 19°14′30″N-19°15′30″N,

104°51′W-104°51′30″W; Station 183 D-2, 3; sandy mud, muddy sand; 54-73 meters; 21 November 1937; four foot dredge; one male.

Costa Rica

Off Ballenas Bay, Gulf of Nicoya; 09°42′-10″N-09°44′52″N, 84°51′08″W-84°51′25″W; Station 213 D-11, 13-15; mud; 63.7-73 meters; 25 February 1938; four foot dredge; three males, two females.

Off Ballenas Bay, Gulf of Nicoya; 09°42′N, 84°56′W; Station 213 D-17; mud; 63.7 meters; 25 February 1938; four foot dredge; one male, one female.

Panama

Gulf of Chiriqui; 07°54′45″N, 82°04′32″W; Station 221 D-1; sandy mud; 64 meters; 13 March 1938; four foot dredge; two males.

Measurements. — Males, TL 58-101 mm; females, TL 52-95 mm. Corneal Indices are summarized in Table 2.

Remarks. — The submedian carinae of the fourth abdominal somite are spined posteriorly in all specimens. The bases of the marginal teeth of the telson show no signs of inflation in the smaller males, but specimens 65 to 90 mm long exhibit slight inflation, and larger specimens, 95 mm long or more, have the bases of the marginal teeth noticeably inflated. Some of the larger specimens have traces of one or two small tubercles on the dorsal surface of the telson; these tubercles, when present in *S. panamensis*, are never so well developed as in specimens of *S. hancocki*.

Squilla parva Bigelow, 1891

Squilla parva Bigelow, 1891, p. 94. — Schmitt, 1940, p. 168, fig. 14. — Manning, 1968, p. 129 [listed].

Range. — Eastern Pacific region, from scattered localities between Manzanillo, México, and Cape San Francisco, Ecuador. It has not been recorded previously from Costa Rica or El Salvador.

Material examined. — Twelve specimens from five stations:

México

Tangola-Tangola Bay; 15°45′N-15°45′22″N, 96°05′34″W-96°05′51″W; Station 196 D-16, 17; mud; 29-42 meters; 13 December 1937; four foot dredge; three females.

El Salvador

La Libertad; 13°25′50″N-13°27′20″N, 89°-19′20″W; Station 198 D-1, 2; mud; 24-25 meters; 16 December 1937; four foot dredge; three males.

Meanguera Island, Gulf of Fonseca; 13°08′N, 87°43′W; Station 199 D-1; mud, crushed shell; 29 meters; 23 December 1937; four foot dredge; one male.

Costa Rica

Port Culebra; 10°36′22″N, 85°41′08″W; Station 206 D-3; sandy mud; 25.5 meters; 30 January 1938; four foot dredge; one female.

Panama

Bahia Honda; 07°45′35″N-07°45′51″N, 81°32′18″W-81°32′21″W; Station 222 D-1, 5; rocks, dead coral, mud, shells, leaves; 5.4-20 meters; 18 March 1938; two foot dredge; three males, one female.

Measurements. — Males, TL 22-32 mm; females, TL 19-33 mm. Corneal Indices are summarized in Table 2.

Family Gonodactylidae

Key to Genera and Species of Gonodactylidae from the Eastern Pacific Region

1. Ischiomeral articulation of raptorial claw terminal; merus of claw grooved inferiorly throughout its length 2
1′. Ischiomeral articulation of raptorial claw not terminal, merus projecting posteriorly beyond articulation; inferior groove on merus of claw incomplete; *Gonodactylus* Berthold 9
2. Dactylus of raptorial claw unarmed; sixth abdominal somite unarmed posteriorly; *Hemisquilla* Hansen 3
2′. Dactylus of raptorial claw with teeth; sixth abdominal somite with armed carinae or with posterior spines 4
3. Mandibular palp usually three segmented (25% two segmented; 75% three segmented); length/width ratio of rostral plate usually high (mean 1.34); northern population, southern California to Panama... **H. ensigera californiensis* Stephenson, 1967.
3′. Mandibular palp two or three segmented (45% two segmented, 55% three segmented); length/width ratio of rostral plate usually low (mean 1.17); southern population, Chile ..... *H. ensigera ensigera* (Owen, 1832); Stephenson, 1967; Bahamonde, 1968.
4. Inner spine of basal prolongation of uropod longer than outer; dactylus of raptorial claw with more than four teeth; *Eurysquilla* Manning 5
4′. Inner spine of basal prolongation of uropod shorter than or subequal to outer; dactylus of raptorial claw with three teeth 6

5. Basal prolongation of uropod consisting of two spines, with at most rounded lobe on inner margin ..... *E. veleronis* (Schmitt, 1940).

5′. Basal prolongation of uropod consisting of two spines with series of spinules on inner margin..... *E. solari* Manning, 1970.

6. Basal prolongation of uropod with two spines, inner margin unarmed; *Pseudosquilla* Dana; **P. adiastalta* Manning, 1964.

6′. Basal prolongation of uropod with three spines, proximal smallest 7

7. Anterior five abdominal somites with prominent longitudinal carinae; telson with submedian denticles in adults; *Parasquilla* Manning; *P. similis* Manning, 1970.

7′. Anterior five abdominal somites lacking longitudinal carinae; telson lacking submedian denticles in adults; *Pseudosquillopsis* Serène 8

8. Lateral processes of sixth and seventh thoracic somites with posterolateral spine..... *P. marmorata* (Lockington, 1877); Manning, 1969a.

8′. Lateral processes of sixth and seventh thoracic somites rounded posterolaterally..... *P. lessonii* (Guérin, 1830); Schmitt, 1940; Bahamonde, 1968.

9. Carinae of telson unarmed dorsally, lacking dorsal tubercles or spinules (median and anterior submedian carinae often with posterior tubercle or spinule).....10

9′. Carinae of telson with dorsal spinules or tubercles 12

10. Telson of Bredini-type, with intermediate marginal teeth not widely set off from submedians, intermediate denticles set at or posteriorly to level of intermediate tooth.. .....**G. zacae*, new species.

10′. Telson of Oerstedii-type, with intermediate marginal teeth distinct and intermediate denticles recessed anteriorly.....11

11. Median carina of telson with posterior spine; males 12 to 20 mm in length with median carina inflated, obscuring anchor.. ..... *G. pumilus* Manning, 1970.

11′. Median carina lacking posterior spine; males 12 to 20 mm in length with normal median carina of telson, not noticeably inflated ..... *G. oerstedii* Hansen, 1895; Schmitt, 1940; Manning, 1969.

12. Knob posterior to apex of median carina unarmed .....**G. stanschi* Schmitt, 1940.

12′. Knob posterior to apex of median carina with two or more posterior tubercles or spinules 13

13. Accessory median carinae of telson short, not extending anteriorly for one-fourth length of median carina, fusing posteriorly with median carina to form anchor..... .....**G. festae* Nobili, 1901.

13′. Accessory median carinae of telson long, extending anteriorly almost to base of median carina 14

14. Knob with no more than two spinules; anterolateral angles of rostral plate spiniform .....**G. bahiahondensis* Schmitt, 1940.

14′. Knob with four or more spinules; anterolateral angles of rostral plate acute but not spiniform ....**G. lalibertadensis* Schmitt, 1940.

Hemisquilla ensigera californiensis Stephenson, 1967

Hemisquilla stylifera. — Schmitt, 1940, p. 182, fig. 18a [other references].

Hemisquilla ensigera. — Manning, 1963a, p. 315.

Hemisquilla ensigera californiensis Stephenson, 1967, p. 15.

Range. — Eastern Pacific region, from southern California, México (including Gulf of California), and Panama. The nominal subspecies is known from off Chile, and a third subspecies, *H. e. australiensis* Stephenson, occurs off Australia (Stephenson, 1967).

Material examined. — Two specimens from two stations:

México

Arena Bank, Gulf of California; 23°20′N, 109°25′W; Station 136 D-18; 73 meters; 20 April 1936; four foot dredge; one male.

Panama

Gulf of Chiriqui; 07°52′45″N, 82°02′W; Station 221 D-4; sandy mud; 69 meters; 13 March 1938; four foot dredge; one male.

Measurements. — Males only examined, TL 90 and 104 mm.

Remarks. — Stephenson (1967) recognized the three Pacific populations (Californian, Chilean, and Australasian) as distinct subspecies, based on analyses of characters from samples from these three areas as well as on their apparent distinct, isolated geographic ranges. Characters used by Stephenson include the number of segments on the mandibular palp, the number of intermediate denticles (lobes) on the telson, and proportions of the rostral plate and the eye (see Table 3). As might be expected, all of the characters used by Stephenson overlap broadly; in spite of this, as he pointed out, the Chilean population appears to be as distinct from the Californian as it is from

the Australasian. Although the recognition of three subspecies is probably sound on a biological basis, the broad overlap of characters makes it difficult at best to identify a single specimen to the subspecific level on any basis other than geography. For the present, at least, it seems best to consider the single specimen from Panama recorded here, as well as the single, small (CL 6.0 mm) damaged specimen from Jicarita Island, Panama, reported by Stephenson (1967), but not identified to subspecies, with the Californian subspecies. The relatively large numbers of specimens from localities off Mexico reported by Stephenson suggest that the northern population of *H. ensigera* extends from southern California to at least northern Panama; the southern population is not known to occur north of Chile.

A note accompanying the specimen from station 136 identified it as a "giant purple-uropoded Squilla." Apparently members of both American subspecies have brightly colored uropods.

Eurysquilla veleronis (Schmitt, 1940)

Pseudosquilla veleronis Schmitt, 1940, p. 176, fig. 17. — Manning, 1963, p. 314 [listed; transferred to *Eurysquilla*].

Range. — Eastern Pacific region, where it has been recorded from Angeles Bay, Gulf of California, and Chacahua Bay and off Petatlán Bay, both Oaxaca, México.

Material examined. — México; Tangola-Tangola Bay; 15°44′58″N, 96°05′13″W; Station 196 D-18; mud; 55 meters; 13 December 1937; four foot dredge; one male, two females.

Measurements. — Male, TL 17 mm; females, TL 18 mm.

Remarks. — All three specimens are juveniles. Most adult features are discernible, but all three have submedian denticles on the telson; these denticles, apparently characteristic of postlarvae and juveniles of *Eurysquilla,* are not present in adults.

Pseudosquilla adiastalta Manning, 1964

Pseudosquilla oculata. — Schmitt, 1940, p. 173, fig. 15 [not *P. oculata* (Brullé)].

Pseudosquilla adiastalta Manning, 1964, p. 304, fig. 1.

Range. — Eastern Pacific region, from the Tres Marias Islands, México, to the Galapagos Islands, including Clarion and Clipperton Islands and localities off Panama and Colombia.

Material examined. — Eight specimens from four stations:

México

Sihuatenejo Bay; in coral; 24 November 1937; one male.

Port Guatulco; 15°44′54″N, 96°07′57″W; Station 195 D-15; in coral; 2.7 meters; 6 December 1937; diving; four females.

Costa Rica

Port Parker; in coral; 16-17 January 1937; one male.

Jasper Island; in coral; 22-25 February 1937; two males.

Measurements. — Males, TL 25-57 mm; females, TL 33-55 mm.

Pseudosquillopsis marmorata (Lockington, 1877)

Squilla marmorata Lockington, 1877, p. 33.

Pseudosquilla lessonii. — Schmitt, 1940, p. 175, fig. 16 [part; not *P. lessonii* (Guérin, 1830)].

Table 3. Morphometric Data for *Hemisquilla ensigera.*

	H. ensigera ensigera	*H. ensigera californiensis*		
	Chile (Stephenson, 1967)	California (Stephenson, 1967)	136 D-18	221 D-4
Length/Width Rostral Plate:				
Mean	1.17	1.34	1.38	1.21
Range	1.10-1.29	1.10-1.54	–	–
Length Carapace/Length Rostral Plate:				
Mean	4.54	4.05	3.88	4.28
Range	4.10-5.15	3.50-4.57	–	–
Cornea Width/Cornea Length:				
Mean	1.27	1.32	1.29	1.19
Range	1.18-1.38	0.95-1.55	–	–
Eye Length/Cornea Length:				
Mean	1.51	1.46	1.47	1.38
Range	1.41-1.65	1.12-1.92	–	–

Pseudosquillopsis marmorata. — Manning, 1969a, pp. 527, 531, figs. 1, 3 [postlarvae and juveniles].

Range. — Eastern Pacific region, from southern California, the Gulf of California, and the Galapagos Islands.

Material examined. — One specimen from one station:

México

Arena Bank, Gulf of California; 23°27′N, 10°24′W; Station 136 D-30; 1 May 1936; 64 meters; four foot dredge; one postlarval female.

Measurements. — Female postlarva TL 28 mm.

Remarks. — Manning (1969a) pointed out the differences between the closely related *P. marmorata* and *P. lessonii* and showed that the species could be distinguished even at the postlarval stage. The specimen reported here agrees well with the account given by me of the postlarvae, except that the posterior spine on the lateral process of the seventh thoracic somite is even more prominent than shown in figure 1 in the 1969 paper.

Genus *Gonodactylus* Berthold

The American species of *Gonodactylus* are particularly troublesome for several reasons. They are very similar, all apparently having been derived from a single stock; all share the accessory intermediate carina on the telson and by this feature can be distinguished from all Indo-west Pacific species of the genus, in excess of 20 in number. Our knowledge of ontogenetic changes in morphology of *Gonodactylus* is limited. Some American species have dorsal tubercles or spinules on the telson and are easily recognizable. Many of the eastern Pacific species of the genus have acute or even spiniform anterolateral angles on the rostral plate; these angles are rounded in all western Atlantic species. Although it is known that the numbers of characters available for use in species distinction is very limited, but some of those which are generally reliable become modified in the adult males; for example, some features of telson morphology are distorted by secondary sexual changes in adult males.

Analysis of a large series of *Gonodactylus* for a review of the western Atlantic species (Manning, 1969) showed that one feature of telson morphology, the shape and position of the intermediate teeth and denticles, could be valuable in species recognition. Schmitt (1940) was the first to point out the utility of these features. He referred to two basic telson types which he found in *G. oerstedii* as the Atlantic and the Pacific types of telson; he noted that these particular telson shapes were not necessarily restricted to Atlantic or Pacific specimens, but that both types of telson could be found in specimens from either ocean.

Manning (1969) considered that these two types of telson reflected specific differences and that the Atlantic species could be characterized by two telson types. Some species have a telson, designated by him as the Oerstedii-type, in which the intermediate marginal teeth are subparallel to and distinct from the submedian teeth and in which the intermediate marginal denticles are recessed anteriorly, that is, set anterior to the apex of the intermediate tooth. Other species share a telson referred to as the Bredini-type, in which the longitudinal axes of the intermediate teeth are convergent posteriorly with the longitudinal axes of the submedian teeth and in which the intermediate denticles are set at or posterior to the level of the apex of the intermediate tooth.

Both of these telson types occur in the eastern Pacific species of *Gonodactylus,* and a new species with a Bredini-type telson is described below. The remainder of the eastern Pacific species recorded here all have the Oerstedii-type telson; in addition, they all have acute anterolateral angles on the rostral plate and dorsal tubercles or spinules on the telson.

All of the characters discussed by Schmitt (1940) in relation to eastern Pacific *Gonodactylus* appear to apply to the specimens taken by the *Zaca* Expeditions, including the shape of the ocular scales, the rostral plate, and telson.

The Abdominal Width-Carapace Length Index, introduced by Manning (1969), has been summarized in tabular form (Table 4) for all of the specimens reported here. The indices overlap broadly, as they did for most western Atlantic species, but it appears that adults of *G. stansclii* have proportionally narrower abdomens than do those of *G. festae.*

None of the eastern Pacific specimens taken by the *Zaca* cruises are particularly large, but all of the specimens of *G. zacae* are unusually small, suggesting that it, like the western Atlantic *G. torus* Manning, is a dwarf species.

Gonodactylus zacae, new species

Figure 3

Holotype. — Male, TL 30 mm; Port Guatulco, México; 15°44′30″N-15°44′35″N, 96°07′-56″W-96°08′W; Station 195 D-7, 8; rocks, sand, algae; 8.2-11 meters; 5 December 1937; two foot dredge; AMNH 14044.

Paratypes. — Fifty-six specimens from seven stations:

Table 4. Summary of Abdominal Width-Carapace Length Indices (AWCLI) for Specimens of *Gonodactylus*.

Carapace Length		*bahiahondensis*	*festae*	*lalibertadensis*	*stanschi*	*zacae*
3	mean	–	–	–	824	873 (6)
	range				–	862-885
4	mean	790 (3)	–	–	–	796 (9)
	range	775-805				767-857
5	mean	802 (3)	–	–	–	790 (12)
	range	788-822				740-846
6	mean	777 (2)	–	833	790 (2)	777 (8)
	range	766-787		–	780-800	745-818
7	mean	753 (3)	–	–	769 (5)	–
	range	740-770			746-792	
8	mean	759 (4)	773 (2)	768	734	–
	range	740-769	768-778	–	–	
9	mean	–	780 (2)	–	733 (3)	–
	range		777-783		713-766	

México

Port Guatulco; 15°44′45″N, 96°07′53″W; Station 195 D-3; sand, crushed shell; 6.3 meters; 4 December 1937; two foot dredge; one male, two females (USNM).

Port Guatulco; 15°44′40″N, 96°07′53″W; Station 195 D-4; sand, algae; 8.2 meters; 4 December 1937; two foot dredge; five males, five females, AMNH 14045, four males (USNM).

Port Guatulco; 15°44′50″N, 96°08′09″W; Station 195 D-5; sand, algae; 3.6 meters; 5 December 1937; two foot dredge; eleven males, six females, AMNH 14045.

Port Guatulco; 15°44′45″N, 96°08′05″W; Station 195 D-6; sand, algae; 5.4 meters; 5 December 1937; two foot dredge; two males, one female, AMNH 14045.

Port Guatulco; data as in holotype; Station 195 D-7,8; five males, eight females, AMNH 14045.

Port Guatulco; 15°44′27″N, 96°07′57″W; Station 195 D-14; coral; 7.3 meters; 6 December 1937; two foot dredge; two males, three females (in two lots), AMNH 14045.

Other material. — Twenty-eight specimens from seven stations:

México

Santa Inez Bay, Gulf of California, Baja California; 27°00′30″N, 111°58′30″W; Station 141 D-3; 33 meters; 10 April 1936; four foot dredge; one male.

Arena Bank, Gulf of California; 23°27′N, 109°24′W; Station 136 D-30; 64 meters; 1 May 1936; four foot dredge; one male.

Costa Rica

Port Parker; 12-23 January 1938; one female.

Port Parker; 10°55′06″N, 85°48′53″W; Station 203 D-4; gravel, algae; 12.8 meters; 12 January 1938; two foot dredge; one male.

Port Parker; 10°55′43″N, 85°49′37″W; Station 203 D-7; shells, algae; 16.4-19.1 meters; 22 January 1938; two foot dredge; four males, four females.

Port Parker; 10°55′51″N, 85°49′52″W; Station 203 D-9; coral; 2.7-7.2 meters; 22 January 1938; two foot dredge; six males, seven females.

Panama

Bahia Honda; 07°45′35″N-07°45′51″N, 81°32′18″W-81°32′21″W; Station 222 D-1,5; rocks, dead coral, mud, shells, leaves; 5.4-20 meters; 18 March 1938; two foot dredge; three males.

Measurements. — Males, TL 9-36 mm; females, TL 8-32 mm. Other measurements of male holotype, TL 30 mm: carapace length, 5.9 mm; fifth abdominal somite width, 4.8 mm; telson length, 4.4 mm, width, 4.5 mm.

Diagnosis. — Anterolateral angles of rostral plate acute but broadly rounded. Ocular scales erect, small, rounded or squarish, not projecting laterally. Lateral process of sixth thoracic somite broadly rounded anteriorly, more truncate posteriorly. Lateral process of seventh thoracic somite truncate anteriorly and posteriorly, slightly more rounded anteriorly, narrower than process of sixth somite. Lower portion of posterior margin of pleura of anterior four abdominal somites straight or nearly so. Anterior five abdominal somites unarmed posterolaterally. Sixth abdominal somite with six

longitudinal carinae, very swollen in large specimens; each carina with posterior spine in small specimens, apices with at most blunt tubercle in adults. Abdominal Width-Carapace Length Indices summarized in Table 4. Telson longer than broad or with length and width subequal, of Bredini type, appearing triangular, without dorsal tubercles or spinules; median carina inflated in most specimens, flask-shaped in juveniles, occasionally with blunt posterior tubercle; accessory median carinae short, extending anteriorly to about midlength of median carina (extending farther anteriorly in small males than in females), fusing posteriorly with median carina to form anchor; anchor completely obliterated by inflation of median carina in adult males; knob rounded, not prominent, unarmed, often fused with inflated median carina; anterior submedian carinae inflated, each with at most a posterior dimple; carinae of submedian teeth inflated, rounded dorsally; intermediate, accessory intermediate and marginal carinae well defined, not markedly inflated; submedian teeth with poorly formed shelf on inner margin, lacking anterior angled prominence; low, oblique prominences divergent posteriorly from under knob; submedian teeth convergent posteriorly, movable apices usually absent, numerous small submedian denticles present; intermediate teeth blunt, apices short and rounded, longitudinal axes of teeth convergent with those of submedian teeth; lateral tooth distinct but poorly formed, apex blunt; one rounded intermediate denticle present, set posterior to apex of intermediate tooth; lateral denticle absent. Uropodal endopod broad, inner margin straight or nearly so.

Color. — The color pattern is not well preserved in any of the specimens. In general, males differ from females in having more dark pigment on the ventral surface of the body: the proximal segments of the posterior three maxillipeds and the male copulatory tubes are black, and the thoracic sterna of the posterior three thoracic somites and the bases of the walking legs are dark grey. Color notes accompanying two of the lots indicate that the species is scarlet (male, Station 141 D-3) or vermilion (male, Station 136 D-30) in life.

Remarks. — *Gonodactylus zacae,* new species, is the eastern Pacific counterpart of *G. bredini* Manning from the western Atlantic region; the new species can be distinguished from *G. bredini* by the longer accessory median carinae, which in the new species extend anteriorly to near the midlength of the median carina. It may also be a broader species; the Abdominal Width-Carapace Length Indices of the smaller specimens (862-885) do not overlap those of *G. bredini* of similar size (756-851). The intermediate marginal denticles on the telson in *G. zacae* are always set posterior to the apex of the intermediate tooth, whereas they may be situated more anteriorly in *G. bredini.* Finally, the new species is a smaller species, not known to exceed 36 mm in length; *G. bredini* may attain a length of 75 mm.

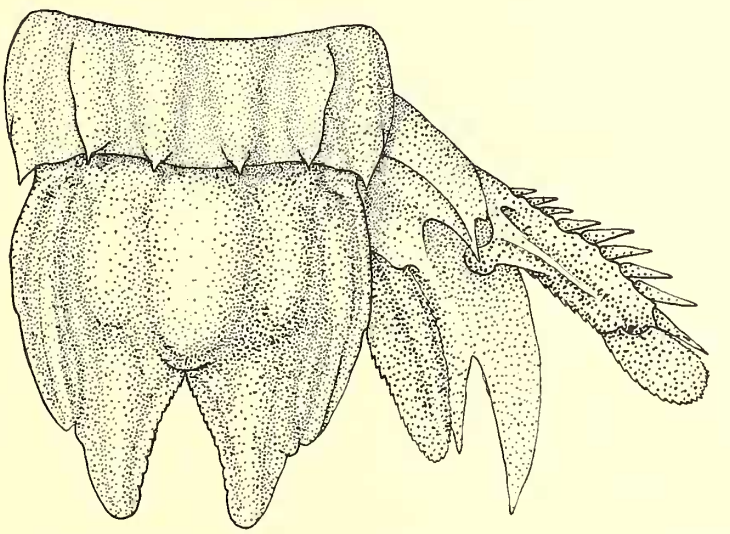

FIGURE 3. **Gonodactylus zacae, new species,** male holotype, TL 30 mm, Port Guatulco, Mexico: sixth abdominal somite, telson, and uropod (setae omitted).

The movable apices of the submedian teeth of the telson may be present in smaller specimens of *G. zacae;* they are not present in specimens larger than 20 mm.

Large males show marked secondary sexual characters, particularly in the inflation of the carinae of the sixth abdominal somite and the median carina of the telson. The inflation of these carinae is visible in specimens as small as 20 mm, and it is usually well developed at a size of 25 mm. In larger individuals, the carinae of the sixth abdominal somite are very inflated and are rarely provided with posterior spines. The median carina of the telson can completely obliterate the accessory medians and the anchor as well; it resembles the median carina found in adult specimens of *G. torus* Manning.

The specimens identified by Schmitt (1940) as *G. oerstedii* with a Pacific type telson may prove to be a member of the species described here; his material will be restudied in a planned review of the eastern Pacific stomatopods.

Gonodactylus stanschi Schmitt, 1940

Gonodactylus stanschi Schmitt, 1940, p. 215, fig. 30.

Range. — Eastern Pacific region, where it had been recorded from several localities between Angel de la Guardia Island, Gulf of California, to Tangola-Tangola, México; the localities recorded here are within the known range of the species.

Material examined. — Thirteen specimens from two stations:

México

Sihuatenejo Bay; in coral; 24 November 1937; two males, five females.

Port Guatulco; 15°44′54″N, 96°07′57″W; Station 195 D-15; coral; 2.7 meters; two males, four females.

Measurements. — Males, TL 19-36 mm; females, TL 12-41 mm. Abdominal Width-Carapace Length Indices are summarized in Table 4.

Color. — Faded in most specimens, but several appear banded with black chromatophores, and some show traces of dark median and lateral patches on the sixth thoracic somite as well as a median dark patch on the first abdominal somite.

Remarks. — This species can be distinguished readily from the other members of *Gonodactylus* bearing spinules on the telson by the reduced number of spinules. The accessory median carinae are always armed posteriorly with a single spine; the anchor found in *G. festae* is not developed. The knob is unarmed, and the dorsal carinae of the submedian teeth are ornamented with no more than one spinule or tubercle; in large specimens the tubercles may be replaced by a dimple in the surface of the carina. The accessory intermediate carinae are unarmed. In large males, 35 mm or more in length, the swollen median carina may completely obliterate the accessory submedian; the posterior denticles of the latter may be represented by obscure tubercles. The dorsal patterns of spinulation of *G. stanschi* are summarized in Table 5.

Gonodactylus festae Nobili, 1901

Gonodactylus festae Nobili, 1901, p. 53. — Schmitt, 1940, p. 220, fig. 32 [other references].

Range. — Eastern Pacific region, from the Gulf of Fonseca, El Salvador to Santa Elena Bay, Ecuador; it had not been recorded north of Salinas Bay, Costa Rica.

Material examined. — Four specimens from four stations:

El Salvador

Fumerole, Gulf of Fonseca; December 1937; one male.

Costa Rica

Port Parker; 12-23 January 1938; one male.

Piedra Blanca Bay; tidepool; 1-6 February 1938; one male.

Table 5. Pattern of Dorsal Spination of Telson in *Gonodactylus* from the Eastern Pacific Region.

	bahiahondensis	*festae*	*lalibertadensis*	*stanschi*
Median Carina	1	0–1	1	1
Accessory Median	0–1	0–4	1	1
Anchor	absent	3–4	absent	absent
Knob	2	4–5	4	–
Anterior Submedian	1+1–2	1+0–3	1+1	1
Submedian	1–3 in 1 row	4–6 in 2 rows	2 in 1 row	0–1
Accessory Intermediate	0–3	3	2	–
Lateral Denticle	–	+	–	–

Panama

Bahia Honda; under stone, low tide; 13-19 March 1938; one male.

Measurements. — Males only examined, TL 38-44 mm. Abdominal Width-Carapace Length Indices are summarized in Table 4.

Color. — Faded in most specimens, but traces of the pigment pattern were visible in the specimen from Bahia Honda. Sixth thoracic somite with broad median, rectangular dark patch and smaller lateral patch on each side. Seventh thoracic somite with posteromedian black spot. First abdominal somite with median rectangular dark patch, fifth abdominal somite with smaller median spot. Each abdominal somite with lateral dark spot on each side. Telson with two anterior black spots between anterior submedian and median carina. Dorsal depression of merus of claw pink with proximal and distal dark spot.

Remarks. — This species can be distinguished by the large numbers of dorsal spinules on the telson, the laterally produced ocular scales, and the presence of a lateral denticle on the telson.

The median carina of the telson in *G. festae* is flanked laterally by a line of two to three tubercles on each side; the anchor is a coronet of spinules. In the larger males the spined accessory median carinae are obliterated by the inflated median carina; in all specimens the dorsal tubercles are still visible. The knob is armed with four to five tubercles or spinules. The dorsal spinules of the submedian carinae are usually arranged in two longitudinal rows. This is the only American species of *Gonodactylus* with a distinct lateral denticle on the telson; the denticle was illustrated by Schmitt (1940, figure 32c) but the legend to his figure is erroneous in placing the denticle on the carapace. Spination patterns of the telson are summarized in Table 5.

The anterolateral angles of the rostral plate in *G. festae* are sharp but never spiniform as in *G. bahiahondensis.* As pointed out by Schmitt (1940), the ocular scales are strongly produced laterally, giving them an angled appearance; the scales are more acutely angled laterally than in any other American species.

Gonodactylus bahiahondensis Schmitt, 1940

Gonodactylus bahiahondensis Schmitt, 1940, p. 217, fig. 31.

Range. — Eastern Pacific region, from scattered localities between Port Parker, Costa Rica, and Cape San Francisco, Ecuador.

Material examined. — Fifteen specimens from six stations:

Costa Rica

Port Parker; in coral; 16-17 January 1938; one male, three females.

Port Parker; 12-23 January 1938; three females.

Port Culebra; coral; 24-31 January 1938; three males, one female (in two lots).

Jasper Island; coral; 22-25 February 1938; one male.

Uvita Bay; coral; two females.

Panama

Bahia Honda; under stone, low tide; 13-19 March 1938; one female.

Measurements. — Males, TL 18-36 mm; females, TL 22-41 mm. Abdominal Width-Carapace Length Indices are summarized in Table 4.

Color. — Faded in most specimens. One specimen was marked with three dark bands on the carapace, the middle one appearing as two submedian dark bars on either side of the midline. Each of the abdominal somites was marked with dark spots arranged more or less in bands. Some specimens had four anterior black spots on the telson. In general, all of the males had a darker background color than the females.

Remarks. — This species can be distinguished readily from the other American species of *Gonodactylus* with dorsal tubercles on the telson by the spiniform anterolateral angles on the rostral plate, the long accessory median carinae, each terminating in a posterior spine, and the presence of not more than two tubercles or spinules on the knob. As in both *G. lalibertadensis* and *G. stanschi,* the accessory median carinae do not fuse posteriorly to form an anchor. As pointed out by Schmitt (1940), the ocular scales are not produced laterally but are inclined anteriorly.

In large males the anterior portions of the accessory median carinae fuse with the inflated median carina, so that the accessory medians appear to be very short; in these specimens the dorsal tubercles of the telson are much smaller than in young specimens. The accessory medians may also disappear anteriorly in large females.

Patterns of dorsal spinulation of the telson are summarized in Table 5.

Gonodactylus lalibertadensis Schmitt, 1940

Gonodactylus festae lalibertadensis Schmitt, 1940, p. 223, fig. 33.

Range. — Eastern Pacific region, where it was known previously only from the type-locality, La Libertad, Santa Elena Bay, Ecuador. The present material extends the range northward to Port Culebra and Uvita Bay, Costa Rica.

Material examined. — Two specimens from two stations:

Costa Rica

Port Culebra; in coral; 24-31 January 1938; one female.

Uvita Bay; in coral; 2-4 March 1938; one female.

Measurements. — Females only examined, TL 27-37 mm. Abdominal Width-Carapace Length Indices are summarized in Table 4.

Color. — The specimen from Uvita Bay is covered with small, black chromatophores in no particular pattern; there are traces of two anterolateral black spots on the telson, each set on one of the anterior tubercles.

Remarks. — *Gonodactylus lalibertadensis* was originally described as a subspecies of *G. festae;* Schmitt pointed out that it resembled both that species and *G. bahiahondensis* in some features. The two specimens taken by the *Zaca* can be distinguished from representatives of both of those species, so it is recognized here as a distinct species.

Gonodactylus lalibertadensis closely resembles *G. bahiahondensis* and differs from *G. festae* in having long accessory median carinae which extend anteriorly to the base of the median carina; these carinae are always armed posteriorly and do not fuse posteriorly under the apex of the median carina to form an anchor. It differs from *G. bahiahondensis* and resembles *G. festae* in that the ocular scales are produced laterally, the anterolateral angles of the rostral plate are acute but not spiniform, the knob is armed with at least four spinules, and the tubercles of the submedian carinae usually are set in two distinct rows; each of the two specimens reported here have but two dorsal tubercles on the submedian teeth, both situated in a dorsal depression in one row. The overall spinulation pattern of the telson is summarized in Table 5.

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